

Appl. No. 10/826,979
Atty. Docket No. 2003B050A
Amdmt. dated July 18, 2006
Reply to Office Action of April 18, 2006

Amendments to the Claims:

This listing of claims will replace all prior versions and listing of claims in this application.

Listing of Claims:

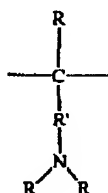
1. (Canceled)

2. (Currently Amended) A laminate comprising:

an ionomer layer and

a tie-layer comprising a (co)extrudable tie resin (CTR). ~~The laminate of claim 1,~~ wherein the CTR comprises a copolymer of one or more C₂-C₁₀ α -olefins and one or more ethylenically copolymerizable amine-containing monomers, the copolymer having amine groups that may be represented by the general formula:

where each R is independently H or a C₁ to C₁₀ hydrocarbon and R' is a bond or a C₁ to C₁₀ hydrocarbon.



3. (Original) The laminate of claim 2, wherein R is H and R' is a bond.

4. (Original) The laminate of claim 2, wherein the C₂-C₁₀ α -olefins are ethylene and/or propylene.

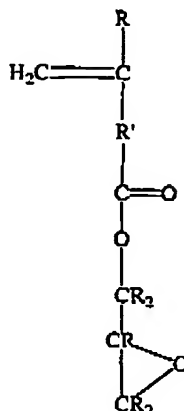
5. (Currently Amended) A laminate comprising:

an ionomer layer and

a tie-layer comprising a (co)extrudable tie resin (CTR). ~~The laminate of claim 1,~~ wherein the CTR comprises an epoxy-containing polymer comprising a copolymer of C₂-C₁₀ α -olefins and epoxy-containing monomers.

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6. (Original) The laminate of claim 5, wherein the epoxy-containing monomer is represented by the general formula:

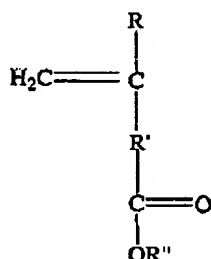


where each R is independently H or a C₁ to C₁₀ hydrocarbon and R' is independently a bond or a C₁ to C₁₀ hydrocarbon.

7. (Original) The laminate of claim 5, wherein the C₂-C₁₀ α-olefins are ethylene and/or propylene.

8. (Original) The laminate of claim 5, wherein the epoxy-containing monomers are selected from the group consisting of glycidyl acrylate and glycidyl methacrylate.

9. (Original) The laminate of claim 5, wherein the copolymer further comprises an ester monomer represented by the general formula:



where each R is independently H or a C₁ to C₁₀ hydrocarbon; each R' is independently a bond or a C₁ to C₁₀ hydrocarbon; and R'' is a C₁ to C₁₀ hydrocarbon.

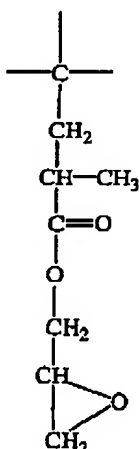
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10. (Original) The laminate of claim 9, wherein the ester monomer is selected from the group consisting of methyl (meth)acrylate, ethyl (meth)acrylate, propyl (meth)acrylate, and butyl (meth)acrylate.

11. (Currently Amended) A laminate comprising:

an ionomer layer and

a tie-layer comprising a (co)extrudable tie resin (CTR). ~~The laminate of claim 1,~~ wherein the CTR comprises a grafted, epoxy-containing polymer represented by the general formula:



12. (Currently Amended) A laminate comprising:

an ionomer layer and

a tie-layer comprising a (co)extrudable tie resin (CTR). ~~The laminate of claim 1,~~ wherein the CTR comprises a grafted, epoxy-containing polymer produced by grafting epoxy-containing monomers onto C₂-C₁₀ α-olefins polymers.

13. (Original) The laminate of claim 12, wherein the C₂-C₁₀ α-olefins polymers are ethylene and/or propylene polymers.

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14. (Currently Amended) A laminate comprising:

an ionomer layer and

a tie-layer comprising a (co)extrudable tie resin (CTR). ~~The laminate of claim 1,~~

wherein the CTR comprises an epoxy-containing polymer, the epoxy-containing polymer comprising glycidyl methacrylate grafted onto polyethylene or a copolymer of ethylene with one or more ester monomers selected from the group consisting of methyl (meth)acrylate, ethyl (meth)acrylate, propyl (meth)acrylate and butyl (meth)acrylate.

Claims 15-27. (Cancelled)

28. (Currently Amended) A laminate comprising:

an ionomer layer and

a tie-layer comprising a (co)extrudable tie resin (CTR). ~~The laminate of claim 1,~~ wherein the CTR comprises a polymer made with an unsaturated diacid.

29. (Original) The laminate of claim 28, wherein the unsaturated diacid is selected from the group consisting of maleic acid, itaconic acid, citraconic acid, and 2-pentenedioic acid.

30. (Currently Amended) The laminate of claim ~~[[1]]28~~, wherein the CTR comprises a polymer made with an anhydride of ~~[[an]]the~~ unsaturated diacid.

31. (Original) The laminate of claim 30, the anhydride is selected from the group consisting of maleic anhydride, itaconic anhydride, citraconic anhydride, and 2-pentendioic anhydride.

32. (Currently Amended) The laminate of claim ~~[[1]]28~~, wherein the CTR comprises a polymer made with a monoester of ~~[[an]]the~~ unsaturated diacid.

33. (Original) The laminate of claim 32, wherein the monoester is selected from the group consisting of a monoester of maleic acid, a monoester of itaconic acid, a monoester of citraconic acid, and a monoester of 2-pentenedioic acid.

Claims 34-39. (Cancelled)

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40. (Currently Amended) The laminate of claim ~~[[1]]~~2, wherein the ionomer layer comprises a first ionomer layer and a second ionomer layer.

41. (Currently Amended) The laminate of claim ~~[[15]]~~40, wherein the first ionomer layer or the second ionomer layer is pigmented, natural, or clear.

42. (Currently Amended) The laminate of claim ~~[[1]]~~2, further comprising a backing layer.

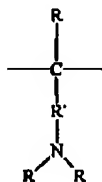
43. (Cancelled)

44. (Currently Amended) A composite comprising:

an ionomer layer;

a tie-layer comprising a (co) extrudable tie resin (CTR); and

a substrate. ~~The composite of claim 43,~~ wherein the CTR comprises a copolymer of one or more C₂-C₁₀ α -olefins and one or more ethylenically copolymerizable amine-containing monomers, the copolymer having amine groups that may be represented by the general formula:



where each R is independently H or a C₁ to C₁₀ hydrocarbon and R' is a bond or a C₁ to C₁₀ hydrocarbon.

45. (Original) The composite of claim 44, wherein R is H and R' is a bond.

46. (Original) The composite of claim 44, wherein the C₂-C₁₀ α -olefins are ethylene and/or propylene.

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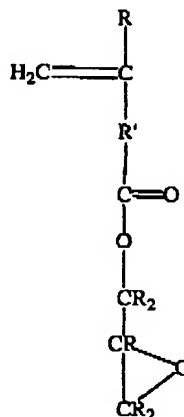
47. (Currently Amended) A composite comprising:

an ionomer layer;

a tie-layer comprising a (co) extrudable tie resin (CTR); and

a substrate. ~~The composite of claim 43,~~ wherein the CTR comprises an epoxy-containing polymer comprising a copolymer of C₂-C₁₀ α-olefins and epoxy-containing monomers.

48. (Original) The composite of claim 47, wherein the epoxy-containing monomer is represented by the general formula:

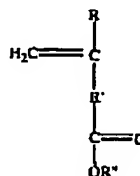


where each R is independently H or a C₁ to C₁₀ hydrocarbon and R' is independently a bond or a C₁ to C₁₀ hydrocarbon.

49. (Original) The composite of claim 47, wherein the C₂-C₁₀ α-olefins are ethylene and/or propylene.

50. (Original) The composite of claim 47, wherein the epoxy-containing monomers are selected from the group consisting of glycidyl acrylate and glycidyl methacrylate.

51. (Original) The composite of claim 47, wherein the copolymer further comprises an ester monomer represented by the general formula:



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where each R is independently H or a C₁ to C₁₀ hydrocarbon; each R' is independently a bond or a C₁ to C₁₀ hydrocarbon; and R'' is a C₁ to C₁₀ hydrocarbon.

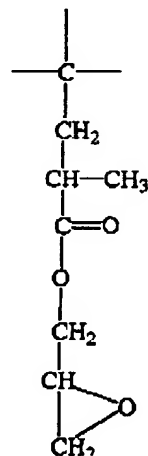
52. (Original) The composite of claim 51, wherein the ester monomer is selected from the group consisting of methyl (meth)acrylate, ethyl (meth)acrylate, propyl (meth)acrylate, and butyl (meth)acrylate.

53. (Currently Amended) A composite comprising:

an ionomer layer;

a tie-layer comprising a (co) extrudable tie resin (CTR); and

a substrate. ~~The composite of claim 43,~~ wherein the CTR comprises a grafted, epoxy-containing polymer represented by the general formula:



54. (Currently Amended) A composite comprising:

an ionomer layer;

a tie-layer comprising a (co) extrudable tie resin (CTR); and

a substrate. ~~The composite of claim 43,~~ wherein the CTR comprises a grafted, epoxy-containing polymer produced by grafting epoxy-containing monomers onto C₂-C₁₀ α-olefins polymers.

55. (Original) The composite of claim 54, where the C₂-C₁₀ α-olefins polymers are ethylene and/or propylene polymers.

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56. (Currently Amended) A composite comprising:

an ionomer layer;

a tie-layer comprising a (co) extrudable tie resin (CTR); and

a substrate. ~~The composite of claim 43,~~ wherein the CTR comprises an epoxy-containing polymer, the epoxy-containing polymer comprising glycidyl methacrylate grafted onto polyethylene or a copolymer of ethylene with one or more ester monomers selected from the group consisting of methyl (meth)acrylate, ethyl (meth)acrylate, propyl (meth)acrylate and butyl (meth)acrylate.

Claims 57-69. (Cancelled)

70. (Currently Amended) A composite comprising:

an ionomer layer;

a tie-layer comprising a (co) extrudable tie resin (CTR); and

a substrate. ~~The composite of claim 43,~~ wherein the CTR comprises a polymer made with an unsaturated diacid.

71. (Currently Amended) The composite of claim ~~[[69]]~~70, wherein the unsaturated diacid is selected from the group consisting of maleic acid, itaconic acid, citraconic acid, and 2-pentenedioic acid.

72. (Currently Amended) The composite of claim ~~[[43]]~~70, wherein the CTR comprises a polymer made with an anhydride of ~~[[an]]~~the unsaturated diacid.

73. (Original) The composite of claim 72, the anhydride is selected from the group consisting of maleic anhydride, itaconic anhydride, citraconic anhydride, and 2-pentendioic anhydride.

74. (Currently Amended) The composite of claim ~~[[43]]~~70, wherein the CTR comprises a polymer made with a monoester of ~~[[an]]~~the unsaturated diacid.

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75. (Original) The composite of claim 74, wherein the monoester is selected from the group consisting of a monoester of maleic acid, a monoester of itaconic acid, a monoester of citraconic acid, and a monoester of 2-pentenedioic acid.

Claims 76-81. (Cancelled)

82. (Currently Amended) The composite of claim ~~[[43]]44~~, wherein the ionomer layer comprises a first ionomer layer and a second ionomer layer.

83. (Original) The composite of claim 82, wherein the first ionomer layer or the second ionomer layer is pigmented, natural, or clear.

84. (Currently Amended) The composite of claim ~~[[43]]44~~, wherein the ionomer layer comprises a zinc-neutralized ionomer or a sodium-neutralized ionomer.

85. (Currently Amended) The composite of claim ~~[[43]]47~~, further comprising a backing layer.

86. (Currently Amended) The composite of claim ~~[[43]]44~~, wherein the thickness of the composite article is from 200 μ m to 6 mm.

87. (Currently Amended) The composite of claim ~~[[43]]44~~, wherein the substrate material is selected from EPDM (ethylene-propylene-diene monomer), EP (ethylene-propylene rubber), acrylonitrile-butadiene-styrene terpolymer, acetal polymer, acrylic polymers, cellulose, fluoroplastics, nylon and other polyamides, polyamide-imide, polycarbonate, polyester, polyetheretherketone, polyetherimide, polyethylene, polyimide, polyphenylene, polyphenylene sulfide, plastomer, polypropylene, polypropylene impact copolymers, polystyrene, polysulfone, polyurethane, polyvinyl chloride, and foams of such materials, as well as blends of these materials.

88. (Currently Amended) The composite of claim ~~[[43]]44~~, wherein the substrate is a polyolefin selected from polyethylene polymers, polyethylene copolymers, polypropylene

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polymers, polypropylene copolymers, polypropylene impact copolymer and a blend of polypropylene impact copolymer and ethylene plastomer, and mixtures thereof.

Claims 89-170. (Cancelled)

171. (Currently Amended) The composite article of claim ~~[[170]]~~172, wherein the laminate is thermoformed.

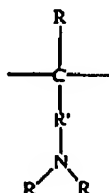
172. (Currently Amended) A composite article formed by the method comprising:

(a) providing a laminate comprising an ionomer layer and a tie-layer comprising a

(co)extrudable tie resin (CTR);

(b) forming a shape from the laminate, resulting in a shaped laminate; and

(c) securing a substrate material to the shaped laminate, wherein the CTR comprises a copolymer of one or more C₂-C₁₀ α -olefins and one or more ethylenically copolymerizable amine-containing monomers, the copolymer having amine groups that may be represented by the general formula:



where each R is independently H or a C₁ to C₁₀ hydrocarbon and R' is a bond or a C₁ to C₁₀ hydrocarbon.

173. (Original) The composite article of claim 172, wherein R is H and R' is a bond.

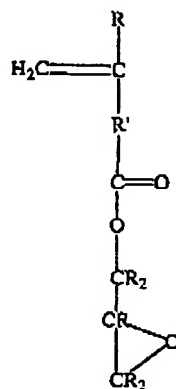
174. (Original) The composite article of claim 172, wherein the C₂-C₁₀ α -olefins are ethylene and/or propylene.

175. (Currently Amended) A composite article formed by the method comprising:

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(a) providing a laminate comprising an ionomer layer and a tie-layer comprising a (co)extrudable tie resin (CTR);
 (b) forming a shape from the laminate, resulting in a shaped laminate; and
 (c) securing a substrate material to the shaped laminate, wherein the CTR comprises an epoxy-containing polymer comprising a copolymer of C₂-C₁₀ α-olefins and epoxy-containing monomers.

176. (Original) The composite article of claim 175, wherein the epoxy-containing monomer is represented by the general formula:



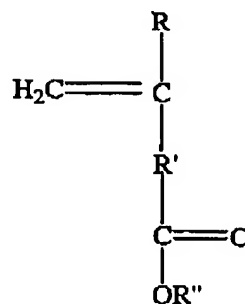
where each R is independently H or a C₁ to C₁₀ hydrocarbon and R' is independently a bond or a C₁ to C₁₀ hydrocarbon.

177. (Original) The composite article of claim 175, wherein the C₂-C₁₀ α-olefins are ethylene and/or propylene.

178. (Original) The composite article of claim 175, wherein the epoxy-containing monomers are selected from the group consisting of glycidyl acrylate and glycidyl methacrylate.

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179. (Original) The composite article of claim 175, wherein the copolymer further comprises an ester monomer represented by the general formula:



where each R is independently H or a C₁ to C₁₀ hydrocarbon; each R' is independently a bond or a C₁ to C₁₀ hydrocarbon; and R'' is a C₁ to C₁₀ hydrocarbon.

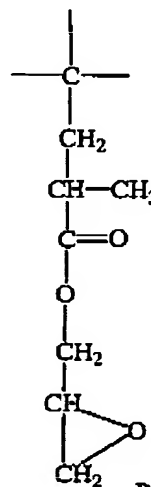
180. (Original) The composite article of claim 179, wherein the ester monomer is selected from the group consisting of methyl (meth)acrylate, ethyl (meth)acrylate, propyl (meth)acrylate, and butyl (meth)acrylate.

181. (Currently Amended) A composite article formed by the method comprising:

(a) providing a laminate comprising an ionomer layer and a tie-layer comprising a (co)extrudable tie resin (CTR);

(b) forming a shape from the laminate, resulting in a shaped laminate; and

(c) securing a substrate material to the shaped laminate, wherein the CTR comprises a grafted, epoxy-containing polymer represented by the general formula:



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182. (Currently Amended) A composite article formed by the method comprising:

- (a) providing a laminate comprising an ionomer layer and a tie-layer comprising a (co)extrudable tie resin (CTR);
- (b) forming a shape from the laminate, resulting in a shaped laminate; and
- (c) securing a substrate material to the shaped laminate, wherein the CTR comprises a grafted, epoxy-containing polymer produced by grafting epoxy-containing monomers onto C₂-C₁₀ α -olefins polymers.

183. (Original) The composite article of claim 182, where the C₂-C₁₀ α -olefins polymers are ethylene and/or propylene polymers.

184. (Currently Amended) A composite article formed by the method comprising:

- (a) providing a laminate comprising an ionomer layer and a tie-layer comprising a (co)extrudable tie resin (CTR);
- (b) forming a shape from the laminate, resulting in a shaped laminate; and
- (c) securing a substrate material to the shaped laminate, wherein the CTR comprises an epoxy-containing polymer, the epoxy-containing polymer comprising glycidyl methacrylate grafted onto polyethylene or a copolymer of ethylene with one or more ester monomers selected from the group consisting of methyl (meth)acrylate, ethyl (meth)acrylate, propyl (meth)acrylate and butyl (meth)acrylate.

Claims 185-197. (Cancelled)

198. (Currently Amended) A composite article formed by the method comprising:

- (a) providing a laminate comprising an ionomer layer and a tie-layer comprising a (co)extrudable tie resin (CTR);
- (b) forming a shape from the laminate, resulting in a shaped laminate; and
- (c) securing a substrate material to the shaped laminate, wherein the CTR comprises a polymer made with an unsaturated diacid.

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199. (Original) The composite article of claim 198, wherein the unsaturated diacid is selected from the group consisting of maleic acid, itaconic acid, citraconic acid, and 2-pentenedioic acid.

200. (Currently Amended) The composite article of claim ~~[[170]]~~198, wherein the CTR comprises a polymer made with an anhydride of ~~[[an]]~~the unsaturated diacid.

201. (Original) The composite article of claim 200, the anhydride is selected from the group consisting of maleic anhydride, itaconic anhydride, citraconic anhydride, and 2-pentendioic anhydride.

202. (Currently Amended) The composite article of claim ~~[[170]]~~198, wherein the CTR comprises a polymer made with a monoester of ~~[[an]]~~the unsaturated diacid.

203. (Original) The composite article of claim 202, wherein the monoester is selected from the group consisting of a monoester of maleic acid, a monoester of itaconic acid, a monoester of citraconic acid, and a monoester of 2-pentenedioic acid.

Claims 204-208. (Cancelled)